

# Type 3A3 DUAL-TRACE DIFFERENTIAL AMPLIFIER



100  $\mu\text{V}/\text{cm}$  DEFLECTION FACTOR  
DIRECT COUPLED

50,000:1 COMMON-MODE REJECTION

CONSTANT BANDWIDTH  
AT ALL DEFLECTION FACTORS

HI OR LO BANDWIDTH SELECTION

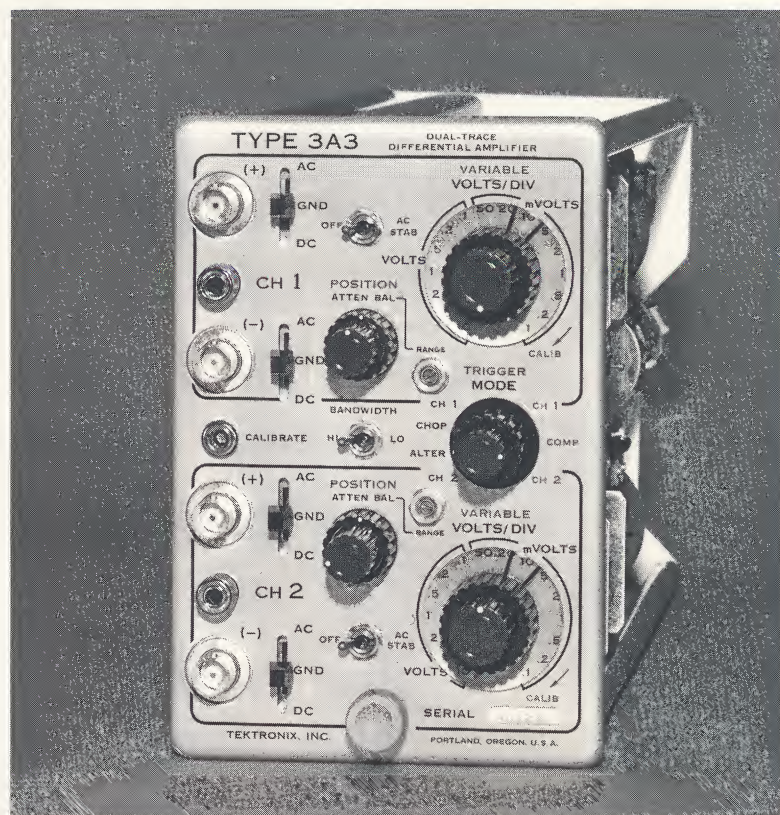
AC STABILIZATION

The Type 3A3 Dual-Trace Differential Amplifier is designed to use in the Type 561A, Type 564, Type 565, or Type 567 Oscilloscope. However, in the Type 567, the measurements will not be presented in digital form. Used with the Type 129 Power Supply, the Type 3A3 can drive recorders, X-Y plotters, oscilloscopes, and other indicators. The Type 3A3 contains two independent high-gain amplifier channels. Either channel may be used to produce a display, or the two channels may be electronically switched to produce dual-trace displays. The Type 3A3 has high sensitivity with direct-coupled inputs and a high degree of common-mode rejection.

**DEFLECTION FACTOR** from 100  $\mu\text{V}/\text{cm}$  to 10 V/cm is in 16 calibrated steps with 1-2-5 sequence, and is accurate within 3%. Continuously adjustable (uncalibrated) from 100  $\mu\text{V}/\text{cm}$  to at least 25 V/cm.

**BANDWIDTH** for both channels is selected at the front panel. Either HI (DC to greater than 500 kHz at  $-3\text{ dB}$ ) or LO (DC to 5 kHz at  $-3\text{ dB}$ ) bandwidth is available. The selected bandwidth remains constant at all deflection factors.

**AC STABILITY** for each channel provides virtually drift-free operation in the 4 most sensitive ranges. With AC stability, and direct input coupling, the low-frequency  $-3\text{ dB}$  points are approximately 0.15 Hz at 1 mV/cm, 0.3 Hz at 0.5 mV/cm, 0.75 Hz at 0.2 mV/cm, and 1.5 Hz at 0.1 mV/cm.



**DISPLAY MODES** include CH 1, CH 2, or dual-trace with either chopped or alternate switching. In chopped operation, electronic switching occurs at approx a 250-kHz rate to show successive 2- $\mu\text{s}$  segments of each trace. Chopped transient blanking is provided.

**NOISE** with grounded input is less than 10  $\mu\text{V}$  peak to peak with LO bandwidth, less than 40  $\mu\text{V}$  peak to peak with HI bandwidth.

**DRIFT** is typically less than 500  $\mu\text{V}/\text{hour}$  after 30-minute warm-up.

**PHASE SHIFT** is less than  $2^\circ$  from DC to 100 kHz between any 2 Type 3A3 Amplifiers used in X-Y operation. Phase shift can be adjusted to  $0^\circ$  at any particular deflection factor.

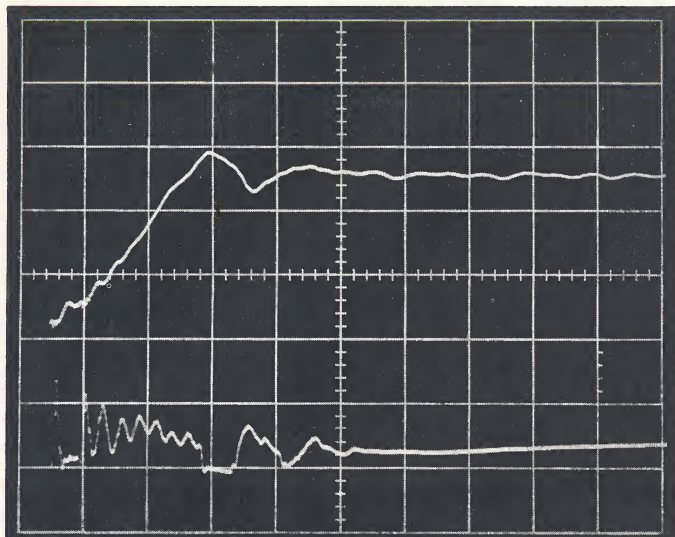
**MULTIPLE X-Y DISPLAYS** can be obtained with two Type 3A3 Plug-In Units. Dual-trace switching is synchronized, so that one Y-channel remains plotted against the same X-channel once the display is set up. There is no provision for consistent pairing each time the system is operated.

**INPUT COUPLING** can be AC or DC, and is individually selected for each input (2 per channel). Amplifier input grids can be grounded with these same controls. With AC coupling, the low-frequency  $-3\text{ dB}$  point is approximately 2 Hz direct, or 0.2 Hz with 10X probe.

**INPUT RC** is 1 megohm paralleled by 47 pF. The input R can be disconnected by removing internal wire link.

**TRIGGER PICKOFF** is internally coupled, and can be selected from CH 1, CH 2, or the composite signal after switching.





## IMPACT STUDY

Chopped display of displacement and acceleration of a body at rest being struck by a solenoid plunger. Strain gage is differentially connected to upper channel at 100  $\mu\text{V}/\text{cm}$  (DC coupled). Accelerometer is connected single-ended to the lower channel at 200  $\mu\text{V}/\text{cm}$  (DC coupled).

**DIFFERENTIAL CF OUTPUTS** are available at the plug-in unit rear connecting pins. These ground-referenced outputs can be used to drive recorders with high input impedance, or other equipment. Output from CH 1 or CH 2 is a differential  $\approx 2.5$ -volt signal for each centimeter of displayed signal. Output from the common output amplifier is a differential  $\approx 5$ -volt signal for each centimeter of displayed signal. Bandwidth is DC to  $\approx 500$  kHz with a non-capacitive load. Jacks can be easily installed at the rear of the oscilloscope to provide access to these outputs.

## INTERCHANNEL ISOLATION

**ELECTROSTATIC ISOLATION** is  $10^6:1$  (120 dB) or better referred to input signal levels.

**SWITCHING ISOLATION** in chopped operation is 100:1 or better referred to centimeters of display. The switching circuit introduces negligible interaction in all other operating modes.

## TYPE 3A3 DUAL-TRACE DIFFERENTIAL AMPLIFIER . . \$790

Each instrument includes: 4—BNC-to-binding-post adapters (103-0033-00); 2—BNC-to-BNC 18" red patch cords (012-0087-00); 2—Instruction Manual (070-0408-00).

U.S. Sales Price f.o.b. Beaverton, Oregon  
Please refer to Terms and Shipment, General Information page.

| COMMON-MODE REJECTION <sup>A</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                              |                                    |                                                     |                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|------------------------------------|-----------------------------------------------------|------------------------------------|
| 0.1 mV/cm to 10 mV/cm <sup>B</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                              |                                    |                                                     |                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Referred to Input Connectors |                                    | Referred to Input of Properly Adjusted P6023 Probes |                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | DC-Coupled Input             | AC-Coupled Input With Low-Z Source | DC-Coupled Input                                    | AC-Coupled Input With Low-Z Source |
| DC to 100 kHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 50,000:1                     |                                    |                                                     |                                    |
| 500 kHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1,000:1                      | 1,000:1                            |                                                     |                                    |
| DC to 10 Hz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                              |                                    | 50,000:1                                            |                                    |
| 15 Hz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                              | 500:1                              |                                                     |                                    |
| 60 Hz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                              | 2,000:1                            |                                                     |                                    |
| 100 Hz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                              |                                    | 10,000:1                                            |                                    |
| 1 kHz to 10 kHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                              |                                    | 1,000:1                                             | 1,000:1                            |
| 100 kHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                              | 50,000:1                           | 500:1                                               | 500:1                              |
| 20 mV/cm to 10 V/cm <sup>C</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                              |                                    |                                                     |                                    |
| (Equal to, or adjustable to, the following CMR ratios.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                              |                                    |                                                     |                                    |
| DC to 1 kHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 10,000:1                     |                                    |                                                     |                                    |
| DC to 100 kHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1,000:1                      |                                    |                                                     |                                    |
| 500 kHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 500:1                        | 500:1                              |                                                     |                                    |
| 15 Hz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                              | 500:1                              |                                                     |                                    |
| 60 Hz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                              | 2,000:1                            |                                                     |                                    |
| <sup>A</sup> For ground-referenced sine-wave common-mode signals.<br><sup>B</sup> With 10 volts peak to peak or less in common mode at input connectors.<br><sup>C</sup> With common-mode amplitude at input connectors of 100 volts peak to peak or less from 20 mV/cm to 0.1 V/cm, and with 600 volts peak to peak or less from 0.2 V/cm to 10 V/cm.<br>These common-mode signals will not overdrive the amplifier:<br>0.1 mV/cm to 10 mV/cm, $\pm 20$ V from ground (40 V peak to peak AC)<br>20 mV/cm to 0.1 V/cm, $\pm 200$ V from ground (400 V peak to peak AC)<br>0.2 V/cm to 10 V/cm, $\pm 600$ V from ground (1200 V peak to peak AC) |                              |                                    |                                                     |                                    |